NEUROSENSORY ASSESSMENT OF INFRAORBITAL NERVE FOLLOWING ISOLATED UNILATERAL ZYGOMATICOMAXILLARY COMPLEX FRACTURES - A PROSPECTIVE STUDY

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in partial fulfilment of the requirements
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CERTIFICATE

This is to certify that **Dr. VINOD KRISHNA. K,** Post Graduate student (2014-2017) in the Department of **Oral and Maxillofacial Surgery,** Adhiparasakthi Dental College and Hospital, Melmaruvathur – 603319, has done this dissertation titled **"NEUROSENSORY ASSESSMENT OF INFRAORBITAL NERVE FOLLOWING ISOLATED UNILATERAL ZYGOMATICOMAXILLARY COMPLEX FRACTURES - A PROSPECTIVE STUDY"** Under our direct guidance and supervision in partial fulfilment of the regulations laid down by the Tamilnadu Dr.M.G.R Medical University, Chennai – 600032 for MDS., (Branch-III) **Oral and Maxillofacial Surgery** degree examination.

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DECLARATION

TITLE OF THE DISSERTATION	Neurosensory Assessment of Infraorbital Nerve Following isolated Unilateral Zygomaticomaxillary Complex Fractures- A Prospective Study
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I hereby declare that no part of the dissertation will be utilized for gaining financial assistance or any promotion without obtaining prior permission of the Principal, Adhiparasakthi Dental College and Hospital, Melmaruvathur – 603319. In addition, I declare that no part of this work will be published either in print or in electronic media without the guides who has been actively involved in dissertation. The author has the right to reserve for publish work solely with the permission of the Principal, Adhiparasakthi Dental College and Hospital, Melmaruvathur – 603319

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ABSTRACT

BACKGROUND:

The sensory disturbances of the IO nerve are frequently present in zygomatic complex fractures. In most cases fracture lines involve the IO foramen, canal, or fissure the nerve can be damaged by a secondary mechanism through a blunt, crush type of injury or by a bony compression of the nerve at the fracture site as it leaves the IO foramen. The regenerative capacity of IO nerve is a controversial topic in the literature. The recovery rate of sensation depends on several factors, including the nature of injury to the nerve, the time between the injury and surgical intervention and method of treatment. To assess the neurosensory recovery of infra orbital there are several subjective methods. This prospective study was designed to assess the neurosensory recovery of infra orbital nerve following isolated zygomatic maxillary fractures.

AIM:

To assess the infraorbital nerve injury following isolated unilateral zygomaticomaxillary complex fracture and to assess the recovery of infraorbital nerve injury over the period of six months

MATERIALS AND METHODS:

This is a prospective study conducted on 15 patients with isolated unilateral zygomatic complex fractures (ZMC) with clinically and radiographically isolated complex zygomatic maxillary complex

fractures (ZMC), who were planned for open reduction and internal fixation (ORIF) in the Department of Oral and Maxillo-Facial Surgery, Adhiparasakthi dental college and hospital, Melmaruvathur, from 2014-2016. Patients with comminuted zygomatic fractures, combined Le fort fractures, bilateral zygomatic complex fractures and non- displaced fractures were excluded in this study. Subjective methods of light touch monofilament test, cotton wisp test, cold thermal test and two point discrimination test were performed pre operatively, post operatively - I week, I month, III month and at VI month were evaluated and compared to the normal side

RESULTS:

All the patients have underwent open reduction and internal fixation under general anaesthesia with mini plates and screws, there was no significant changes in post-operative period of I week, I month. There was statistically significant changes at the post operative period of VI month, all the patient had got infra orbital nerve recovery.

CONCLUSION:

The incidence of functional nerve disturbances is acceptable, since the progression towards recovery is inevitable. This study also states that the patients underwent open reduction with internal fixation had a good recovery of the nerve injury.

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INTRODUCTION

Zygomatic fractures are the most common facial injuries, representing after the most common fractures or the second in frequency after the nasal bone fracture.

Zygomatic fractures have been recognized since 1650 B.C. The frequency of zygomatic fractures is due to its prominent lateral location in the mid face.

Most studies indicate in male predilection of fractures with the ratio of 4:1 over females. The etiology for the fracture is the same for the past fifty yearsare road traffic accident, falls, sports, assaults and industrial accidents being the most common causes for the middle third fractures of the face.[56]

Schilli reported that 95% of zygomatic fractures, the fracture line involve the infra orbital foramen and cause the some degree of sensory disturbances.[73]

The infra orbital nerve is rarely contused at its exist from the foramen since it is well covered at this point and paresthesia over its distribution is indicative of fracture either through the anterior wall of the antrum or involving the bony canal as it traverses the orbital floor. In cases where radiologically difficult to demonstrate fracture,

presence of paresthesia is strongly suggestive of the fracture of zygomatic complex.

The orbital floor is thin S-shaped antero-posteriorly. The infraorbital groove and the canal travel the floor carrying the infraorbital nerve which further causes weakening of the floor of the orbit. This anatomy relates to the clinical signs of facial numbness, paresthesia or dysesthesia affecting the ala of the nose, cheek, upper lip and anterior teeth after an orbital floor or zygomatic fracture. Inadequate management of such fractures can lead to persistent disturbance in the area innervated by the infraorbital nerve. Therefore, fractures of the zygomatic complex are characterized by sensory neuropathy (specifically hypoesthesia) in the area of innervation of the IO nerve both as a presenting symptom and as a postoperative complication.

Some studies, have shown that persistent disturbances in IO nerve function were present in nearly half their cases, while others have observed a lower rate of about 10%at 1 year follow-up. When these fractures are not treated promptly or are inadequately managed, IO nerve dysfunction is extremely common and has been reported in 47% of cases presenting for reoperation owing to residual esthetic and functional problems.

The sensory disturbances of the IO nerve are frequently present in zygomatic complex fractures. In most cases fracture lines involve the IO foramen, canal, or fissure the nerve can be damaged by a secondary mechanism through a blunt, crush type of injury or by a bony compression of the nerve at the fracture site as it leaves the IO foramen. The regenerative capacity of IO nerve is a controversial topic in the literature. The recovery rate of sensation depends on several factors, including the nature of injury to the nerve, the time between the injury and surgical intervention and method of treatment.

Symptoms of nerve injury may be varied from paresthesia, numbness at the site of nose, upper lip. Several methods of sensory testing have been applied ie gross mapping of altered areas of sensation, the subjective tests involving two point discrimination test, light touch monofilament test, cold thermal test, cotton wisp test are done to assess the recovery of the infraorbital nerve injury following the zygomatic complex fracture and post surgical assessment of nerve injury.

Few studies have suggested that the treatment of isolated zygomatic complex fracture with open reduction and miniplate fixation yields better recovery of sensory function.

Zygomatic fracture management was revolutionized with advent of internal fixation with wires in 1942, in the year 1978 Champey et al. proposed adaptation of osteosynthesis by plate and screw fixation. In the early part of twentieth century different anatomic approaches of the zygomatic bone were approached and reduction of the fracture without fixation were described.

The surgical management of infraorbital nerve requires decompression of nerve by reduction of zygomatic complex fracture and sometimes mobilization of nerve surrounding the soft tissue and help in early recovery of sensory function.

The aim of the present clinical prospective study is to evaluate the recovery and assessment of the infra orbital nerve injury following the isolated unilateral zygomatic complex fractures of the fifteen patients reported to department of oral and maxillofacial surgery, Adhiparasakthi dental college and hospital, Melmaruvathur.

AIM

To assess the infraorbital nerve injury following isolated unilateral zygomaticomaxillary complex fracture and to assess the recovery of infraorbital nerve injury over the period of six months

OBJECTIVES

1. To assess the infraorbital nerve injury following the isolated unilateral zygomaticomaxillary complex fractures.
2. To evaluate the type of injury occurred to infraorbital nerve
3. To study the rate of healing process in the injured infra orbital nerve over a period of six months.

REVIEW OF LITERATURE

1. History of zygomatic fractures have been recognized since 1650 B.C **EDWINSMITH PAPYRUS** noted that such an injury was an aliment not to be treated.
2. **Duverny**in **1751:** Described intraoral and external manipulation of the bone fragments and also drew attention to the value of the contracting of temporalis muscle in realigning the medial displacement of zygomatic arch.
3. **Ferrier**in **1825 :** Attempted to reduce fracture of zygomatic bone through an incision above the arch.
4. **Stromeyer**in **1844 :** Proposed percutaneous traction hook technique in treatment of the zygomatic fracture
5. **Lothrop**in **1906:** Was the first one to describe intra oral approach through fenestration in canine fossa to reduce fractured zygoma.
6. **Keen**in **1906 :** Described upper buccal sulcus approach.
7. **Gillie**in **1927:** Described an approach via temporal space to zygomatic arch[25].
8. **Sunderland (1951)**: He classified nerve injuries Where neuropraxia or 1st degree lesions exist, return to normal sensory function occurs within one week following nerve injury, 1st degree (type 3) takes 1 to 2 months for complete recovery. A neurotmesis or 3rd, 4th or 5th degree nerve injury will show

incomplete recovery of sensory function owing to severe traction or compression[64].

9. **J.B. Brown et al** in **1951:**Described Internal wire pin stabilization for middle third fractures. This method may be used in combination with direct wiring of zygoma to frontal bone, through and through wiring fixation of nose, interdental wiring, open elevation of orbital borders and with most other procedures. The internal wires are stainless steel no 18.8 of a diameter of 0.05 -0.08 inch, with a spear point for drilling bone[37].
10. **Hotte (1970)**: He concluded that it is unable to prevent persisting morbidity of infraorbital nerve regardless of the treatment procedures[32].
11. **Banovetz JD, Duvall AJ (1976):** They stated that the neurological symptoms arise from the fact that the fracture line runs through or in the immediate vicinity of the IO canal and foramen, affecting the IO nerve. This results in dysaesthesia of the skin of the lower eyelid, cheek and nose, the skin and mucosa of the upper lip, gingival and/or teeth on the affected side. Complete impairment of sensation seldom occurs; hypoesthesia is most frequently present followed by paresthesia and hyperesthesia[6].
12. **Ducker J, Harle F and Oliver D (1977)**: They found that recovery of infraorbital nerve took place more frequently after fixation with mini AO compression plate than with wire

osteosynthesis. The inaccurate reduction, since direct visual inspection of the fracture site was lacking[14].

13. **Gerlock and Sinn (1977):** They believed that the chances of regeneration and return of function of infraorbital nerve distinctly increased if the fractures were adequately treated[29].
14. **Sydney N.Smith et al IN 1980**: He presented a case report of a patient with facio cervical emphysema following an undisplaced fracture zygoma is presented. He also discussed about the etiology, consequences and radiographic appearance[60].
15. **Schotland and Spiessl (1980):** They stated that full regression of neurological symptoms might be expected if anatomical repositioning and adequate fixation of the fragments were achieved with wire osteosynthesis[62].
16. **Finlay PM, Ward-Booth RP, Moos KF (1984):** Most cases of IO nerve dysfunction following zygomatic fractures will recover by 6 months. The incidence of residual sensory dysfunction varies with the testing modality. A highly significant beneficial effect on nerve function was noted when plates were used to stabilize fractures[23].
17. **Ellis E, El-Attar A, Moos KF. (1985):** They stated The incidence of sensory disturbances in orbito-zygomatic complex fractures in the immediate post-trauma period varies from 24% to 94%[17].

18. **Andrew Bernard and Donald Sedowsky** in **1986:** Reported a case of monocular blindness secondary to a non displaced malar fracture. They concluded that the blindness was a sequeale of orbital apex syndrome ,which is an extension of superior orbital fissure syndrome involving the optic foramen and optic nerve and resulting retrobulbar neuritis[2].
19. **Peter Jungell et al** in **1987**: In his clinical study of 68 patients with zygomatic complex fracture, 56 patients had sensory disturbances of inferior orbital nerve. 50 patients were operated on and in 42% (21) had persisting hypesthesia[52].
20. **Robinson (1988):** stated that minor compression will give rise only to temporary conduction block, while more severe compression injuries causes Wallerian degeneration distal to the site of injury[57].
21. **K De Man et al** in **1988:** In his study,Thirty eight patients underwent fixation with intra osseus wiring and 68 patients were treated with miniplate osteosynthesis across fronto zygomatic suture. In the group with wire fixation 50% suffered persistent reduced sensitivity in the infra orbital region at follow up examination whereas in group with a miniplate osteosynthesis 22% had persistent neurological defict. Based on these findings miniplate osteosynthesis is recommended in unstable zygomatic fractures with displacement[13].

22. **Jungell P, Lindqvist C (1987):** They stated that In the acute stage of non displaced fractures, at least some degree of hypoesthesia is often encountered as well. Thus post-traumatic paresthesia over the IO nerve has even been considered indicative of fracture[34].

23. **J.Loewinger et al** in **1989:** Reported a case of bradycardia occurring during elevation of zygomatic arch fracture and he also discussed about the possible mechanisms for the phenomenon[39].

24. **L.F.A Stassen et al** in **1989:** Did a prospective study involving 54 patients were undertaken to compare external pin and K-wire fixation of unstable, non-comminuted, tripod malar fracture. The K-wire technique is quicker, fewer complications and better tolerated by patients. There were occasions when this method of stabilization is not enough and in these cases external pins may be an alternative[42].

25. **De Man, Bax, Zingg, Champy (1988):** They described that reduction and fixation were important factors in the recovery of sensory disturbances of the IO nerve[13].

26. **Wilfried. G. Schilli**in **1991:** Preferred osteosynthesis with plates and screws in case of comminuted fractures. He described that simple tripod fractures without great commniution the use of one dynamic compression plate in frontozygomatic area is sufficient for final reduction of fracture. He considered that temporal approach is at least as convenient as cheek approach in case of simple zygomatic fractures[73].

27. **Frank Dal Santo et al** in **1992:** This study compared masseter muscle force in10 male controls with that in 10 male patients who had sustained unilateral zygomaticomaxillarycomplex (ZMC) fractures. Calculation of muscle force was based on measured bite force, electromyogram, and radiographic determination of muscle vectors. The results of study cast uncertainty on the role of the masseter muscle in post reduction displacement of fractured zmc[21].

28. **Markus Zing et al** in **1992:** In their review of 1025 cases have given classification and treatment of zygomatic fractures. A treatment guideline based on simple classification is presented. The emphasis is placed on the indication for closed and open reduction and consistent methods of 3 dimensional alignment and fixation. Post operative results with regard to infraorbital nerve, maxillary sinus dysfunction, malar asymmetry and orbital complication in the treatment of 1025 cases are prevented. In case of classical tripod fractures and comminuted fractures open reduction is recommended[46].

29. **Taicher S, Ardekian L, Samet N, Shoshani Y, Kaffe I (1993):** They stated that The IO nerve is often involved in trauma to the zygomatic complex at the site of the IO fissure, IO canal, or foramen. This results in sensory disturbances including all kinds of dysaesthesia and neuralgiform pain to the skin of the lower eyelid, cheek, lateral side of the nose, and upper lip and to the labial mucosa, gingival and teeth[65].

30. **D.A. Mitchell,S.P.R. Maclead, R.Baiton**in **1995:** Proposed a multipoint fixation at the frontozygomatic suture with microplates. Frontozygomatic suture fracture site is exposed, reduction done by gillie's temporal approach and they used side by side microplate to create stable multipoint fixation at the frontozygomatic suture in the treatment of a sub group of displaced zygomatico-orbital fractures is described[10].
31. **J. P. M. Vriens, K. F. Moos in 1995** says that open reduction and fixation of an orbitozygomatic complex fracture offer a better prognosis for complete recovery of the infraorbital nerve function than elevation only with or without Kirschner wire fixation[72].
32. **A.G. Symyth IN 1995:** Described a modification of a titanium miniplate for the reduction of unstable fracture of malar complex[5].
33. **Edward Ellis and Winai Kittidumkerng** in **1996:** Made an analysis of the treatment for isolated zygomatic complex fractures. They classify the isolated zygomatic complex fractures with CT as severely displaced, segmented or comminuted articulation and are placed in to high-energy category[16].
34. **S.T.O. Sullivan et al IN 1998**: In his study he concluded that ORIF of zygomatic fractures may offer better results than traditional methods in the management of complex fractures. Traditional methods still have a role to play in less complex fractures[61].

35. **Edward Ellis III et al 2004:** Conducted an retrospective study of preoperative and postoperative CT scan of 65 patients with unilateral zmc fractures treated by reduction of zmc complex fractures without internal orbital reconstruction. Examination of follow up CT scan taken after weeks showed that residual effects became smaller and that none of these patients had increase in orbital volume or soft tissue sagging. He concluded that when there is minimal or no soft tissue herniation and minimal disruption of internal orbit, zmc reduction is adequate treatment[18].

36. **Fogaca WC, Fereirra MC, Dellon AL (2004):** They stated that it is extremely difficult to compare across studies that have employed diverse methodologies to assess nerve function. Two-point discrimination, pressure thresholds, pinprick test, masseter silent period, gross assessment with sharp and blunt instruments and thermography, and gross temperature assessments with ethyl chloride, ice, or warmed gutta and, have all been adapted to the study of IO nerve recovery following trauma.

37. **Pedemontet TC, Basili EA (2005):** They stated that when a nerve is compressed, the fibers are ffected differently: the bigger the fiber, the more likely to be affected by trauma. Fibers are therefore affected in the order of their size.

38. **Benoliel R, Birenboim R, Regev E, Eliav E (2005):** They have reported prominent pattern of electrical hypoesthesia immediate post injury in 25 patients which were taken in account in their

study. In this study preoperative evaluation of the results of skin of the lower eyelid, lateral side of nose, cheek and skin of the upper lip and results with electrical detection threshold test show hypoesthesia in 80% of patients and hyperesthesia was reported in 20% of the cases on the lower eye lid[7].

39. **Thangavelu et al** in **2007:** Presented 5 cases of zmc fractures treated with fronto-temporal approach. A Frontotemporal incision as placed up to the depth of temporal fascia. Dissection done and frontal and temporal branches are elevated with the flap. The fracture segments visualized, reduced and stabilized with rigid internal fixation. Advantages include visualization and no visible scar. Disadvantages include prolonged operative time and possible damages to facial nerve[68].
40. **Stephen maturo et al** in **2008:**He described that sublabial approach combined with an extended upper blepharoplasty/ lateral eyebrow incision is usually adequate for two point fixation while trans conjunctival approach is used when orbital rim and/or floor needs repair[63].
41. **Eric J Dierks et al** in **2009:** He described that 4 potential sites of plate application, it is the Zygomatico maxillary buttress that require the greatest attention to plate bending detail. The preliminary creation of 4 cardinal bends in a typical L shaped plate will expedite the operation of open reduction and rigid internal fixation[20].

42. **Greg J Knepil et al** in **2010:** He described the data regarding the use of prophylactic antibiotics and infection rate following surgery for fracture of the zygomatic bone. This data has demonstrated that prescription of antibiotic prophylaxis for surgery for fractures of the zygomatic bone is extremely variable and infection rate is low[30].

MATERIALS AND METHODS

STUDY SUBJECTS

This is a prospective study conducted on 15 patients with isolated unilateral zygomatic complex fractures (ZMC) with clinically and radiographically isolated complex zygomatic maxillary complex fractures (ZMC), who were planned for open reduction and internal fixation (ORIF) in the Department of Oral and Maxillo-Facial Surgery, Adhiparasakthi dental college and hospital, Melmaruvathur, from 2014-2016.

INCLUSION CRITERIA

The criteria for case selection consisted of one or more clinical signs and symptoms that are restricted mandibular movement, diplopia, infraorbital paraesthesia, palpable step deformity of orbital rim, tenderness at fractured points and visible depression of the prominence of cheek.

EXCLUSION CRITERIA

Patients with comminuted zygomatic fractures, combined Le fort fractures, bilateral zygomatic complex fractures and non- displaced fractures were excluded in this study.

SURGICAL PROTOCOL:

A Proforma was completed for each patient requiring surgical treatment detaling the name, age, sex, date of injury, etiology, date of appearance at hospital, presence of diplopia, infraorbital nerve

paraesthesia, limitation of mandibular movement, site of injury and method of surgical treatment. Complete neurological evaluation was done to rule out head injury.

Armamentarium

1. Howarth's periosteal elevator
2. Rowe's zygomatic elevator
3. Bone plates and screws
4. Plate holding plier
5. Plate bending plier
6. Screw holder
7. Screw driver
8. Needle holder
9. Suture materials
10. Micromotor and handpiece
11. 701 Burs
12. Artery forceps
13. Suction tips
14. Retractors
15. Diathermy
16. Cotton roll & Cotton swab
17. Blunt divider
18. Metal scale
19. 10gm monofilament
20. Diethyl ether

Fig 1: SURGICAL ARMAMENTARIUM

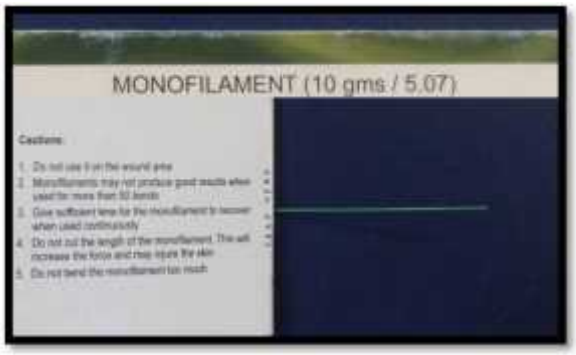

FIGURE 2: MONOFILAMENT

FIGURE 3: DIETHYL ETHER

FIGURE: 4: BLUNT DIVIDER AND METAL SCALE

SURGICAL STEPS

Preparation:

Surgical site preparation done pre operatively, facial hair and head is shaved from the temporal region of the scalp, over an area of about 5 cm square above the bifurcation of the superficial temporal artery (2.5 cm above and anterior to helix of the ear).

Surgical procedure:

After administering, patient put the general anaesthesia through naso-endotracheal intubation, antiseptic ointment was put in both the eyelids and sterile pad was placed over the non-operating side eyeball. Face and temporal region were prepared with betadine painting. Intra oral preparation was also done with betadine.

After face was prepared and draped in a sterile manner, reduction of zygomatic complex was planned through the Gillie's temporal approach.

Gillie's temporal approach was used for 6 cases for the reduction of fractures in all the cases. Before making incision, 2% xylocaine with 1:200,000 adrenaline was infiltrated at the site of incision to achieve local vasoconstriction. A straight incision approximately 2.5 cm length was made at an angle 30 to 40 degree to the horizontal, approximately 1 to 2 cm antero-superior to the helix of the ear. Following blunt dissection and avoidance of the superficial temporal vessels, the white glistening temporalis fascia was uncovered.

After exposure of the temporal fascia, a second deeper incision was made through the fascia to see underlying temporalis muscle. The broad end of Howarth periosteal elevator was then inserted between the temporalis muscle and temporalis fascia. The instrument was swept back and forth while the tip was moved inferiorly until the medial aspect of the zygomatic arch and the infra temporal surface of the body of the zygoma was felt. After having thus ensured that the correct space between the fascia superficially and the muscle on deep aspect has been entered, the periosteal elevator was withdrawn until its tip was just lying under the anterior lip of the incision to act as a guide for the introduction of the Rowe's Zygomatic elevator at the fulcrum to avoid bruising the scalp and damage to the cranium.

Once the elevator was under the body of zygomatic bone, it was used to lift the bone back into its correct anatomical position. An audible click and fullness of the cheek together with palpation for normal contour of the zygomatic bone and orbital rim gave an idea about the adequacy of the reduction supplemented by additional fixation if required.

Once stabilized, the wound was thoroughly irrigated, the Rowe's elevator was then withdrawn and the temporalis fascia closed with a few interrupted 3-ovicryl suture and the skin edges were approximated using 4-o ethilon. Post operatively antibiotics, analgesics and anti-inflammatory medications were prescribed. sutures were removed on

the seventh post operative day. Care should be taken to ensure that no pressure is exerted upon the fracture site until clinical union is completed at the end of approximately 3 weeks. Patients were recalled for check up at one week intervals for the next three months.

Keen's vestibular approach was used for 9 cases for the reduction of fractures in all the cases. Before making incision, 2% xylocaine with 1:200,000 adrenaline was infiltrated at the site of incision to achieve local vasoconstriction. Upper high vestibular incision placed in relation from right upper canine to right maxillary first molar, mucoperiosteal flap raised, the broad end of Howarth periosteal elevator was then inserted below the zygomatic arch to act as a guide for the introduction of the Rows Zygomatic elevator.

Once the elevator was under the body of zygomatic bone, it was used to lift the bone back into its correct anatomical position. An audible click and fullness of the cheek together with palpation for normal contour of the zygomatic bone and orbital rim gave an idea about the adequacy of the reduction supplemented by additional fixation if required at maxillary buttress region.

Once stabilized, the wound was thoroughly irrigated, the Rowe's elevator was then withdrawn and vestibular mucosa closure done with few interrupted 3-o vicryl suture. Post operatively antibiotics, analgesics and anti-inflammatory medications were prescribed. sutures

were removed on the seventh post operative day. Care should be taken is ensure that no pressure is exerted upon the fracture site until clinical union is completed at the end of approximately 3 weeks. Patients were recalled for check up at one week intervals for the next six months.

Lateral eye brow incision placed for the reduction of fronto zygomatic suture fracture (FZS), Before making incision, 2% xylocaine with 1:200,000 adrenaline was infiltrated at the site of incision to achieve local vasoconstriction. A straight incision approximately 1.5 cm length was made at a horizontally on the eye brow. Following periosteum reflected and reduced to its anatomical position and fixation was carried out. Closure were made with with few interrupted sutures with 3-o vicryl and for skin with 4-o ethilon.

Infra orbital incision placed for the reduction of infra orbital rim fracture (IO), Before making incision, 2% xylocaine with 1:200,000 adrenaline was infiltrated at the site of incision to achieve local vasoconstriction. A straight incision approximately 1.5 cm length was made at a horizontally on the infra orbital. Following layer by layer dissection were carried out, periosteum reflected, fracture site identified and reduced to its anatomical position and fixation was carried out. Closure were made with with few interrupted sutures with vicryl and for skin with ethilon.

Fixation technique:

Fixation of the reduced fragments was done by mini plates with mono cortical screws of about 1.5 x 6mm. Intraoperatively, none of these patients had hemorrhage and blood transfused.

Comparing the following parameters, preoperatively and postoperatively, we assessed neurosensory distribution of the infra orbital nerve following open reduction and fixation in isolated zygomatic complex fractures.

Figure 5: Gilley's Temporal approach

Figure 06: Gilley's Temporal approach Skin Closure

Figure 7: Incision Made Over Frontozygomatic Region

Figure 8: Fixation Done in Frontozygomatic Region

Figure 9: Skin Closure made in Frontozygomatic Region

Figure 10: Mini plates and screws fixation in Infra orbital region

Figure 11: Skin Closure done in Infra orbital region

NEUROSENSORY ASSESSMENT:

For the evaluation of the neurosensory responses, subjective method tests performed to know the recovery of IO nerve are as follows:

1. Light touch monofilament test

The light touch monofilament test done in the peripheral, extraoral area of distribution of the of infra orbital nerve (ION) was done on the infra orbital region (IOR), the lateral nasal region (LNR), the upper lip region(ULR), Malar region (MR), by keeping the eyes closed and using a sterile nylon monofilament of force exerting 10 gms to bend is applied to bend for evaluating the sensation in affected and normal side of the individuals and tabulated as presence as '+' and absence as '-

2. Cotton wisp test

The cotton wisp test done in the peripheral, extraoral area of distribution of the of infra orbital nerve (ION) was done on the infra orbital region (IOR), the lateral nasal region (LNR), the upper lip region(ULR), Malar region (MR), by keeping the eyes closed and horizontal stoking of cotton wisp done for evaluating the sensation in affected and normal side of the individuals and tabulated as presence as '+' and absence as '-'

3. Cold thermal test

The cold thermal test done in the peripheral, extraoral area of distribution of the of infra orbital nerve (ION) was done on the infra orbital region (IOR), the lateral nasal region (LNR), the upper lip region(ULR), Malar region (MR), by keeping the eyes closed and topical application using sterile swab immersed in the diethyl ether for evaluating the sensation in affected and normal side of the individuals and tabulated as presence as '+' and absence as '-'

4. Two point discrimination test

The 2-point discrimination test in the peripheral, extraoral area of distribution of the of infra orbital nerve (ION) was done on the infra orbital region (IOR), the lateral nasal region (LNR), the upper lip region(ULR), Malar region (MR), by using blunt divider and metal scale for measurement in millimeters by keeping the eyes closed. For evaluation of the discriminatory power, the smallest distance in millimeters of the 2 adjacent points felt simultaneously was recorded. This test was repeated in normal side for comparsion and tabulated.

Time of assessment

Preoperatively

1 week post operatively

1 month post operatively

3 months post operatively

6 months post operatively

Fig.12. Two point Discrimination test

Fig.13.Light touch monofilament test

Fig.14. Cotton Wisp test

Fig.15 . Cold thermal test

STATISTICAL METHODS USED IN THIS STUDY

The statistical analysis was done using SPSS (Statistical Package for Social Sciences) Version 15.0 statistical Analysis Software. The values were represented in number (%) and mean ± SD.

For two point discrimination un paired ‘t’ test was used and for cotton wisp test, cold thermal test and light touch mono filament test ‘fischer exact test’ were used.

RESULTS

A Total of fifteen patients with fracture of zygomatic complex were treated in Adhiparaskthi Dental College and Hospital, Melmaruvathur. All of them had isolated fractures of the Zygomatic complex with displacement, without any other fracture of the Maxillo Facial Skeleton.

All of these patients were healthy adults ranging from 27-51. All the patients present study were males. All fifteen were referred to the department after accident. All the patients had fracture on right side. Most of the patients had complained and swelling on the fractured sides. Most of the patients had the classical clinical features suggesting of Zygomatic Maxillary Complex fractures. All the patients had radiographs taken and diagnosis confirmed.

The various aspects evaluated in this study are recorded in the following tables.

Table 17 shows light touch monofilament test evaluation in left side (normal side), Table 18 shows light touch monofilament test evaluation in right side (affected side) which includes pre operative evaluation, post operative evaluation with the duration of - I week, I month, III month and VI month with fifteen number of cases, area specification – Infra orbital region, lateral nasal region, upper lip

region, malar region, tabulated the presence of sensation as '+' and absence of sensation as '-'.

Table 19 shows cotton wisp test evaluation in left side (normal side), Table 20 shows cotton wisp test evaluation in right side (affected side) which includes pre operative evaluation, post operative evaluation with the duration of - I week, I month, III month and VI month with fifteen number of cases, area specification – Infra orbital region, lateral nasal region, upper lip region, malar region, tabulated the presence of sensation as '+' and absence of sensation as '-'.

Table 21 shows cold thermal test evaluation in left side (normal side), Table 22 shows cold thermal test evaluation in right side (affected side) which includes pre operative evaluation, post operative evaluation with the duration of - I week, I month, III month and VI month with fifteen number of cases, area specification – Infra orbital region, lateral nasal region, upper lip region, malar region, tabulated the presence of sensation as '+' and absence of sensation as '-'.

Table 23 two point discrimination test evaluation in left side (normal side), Table 24 shows two point discrimination test evaluation in right side (affected side) which includes pre operative evaluation, post operative evaluation with the duration of - I week, I month, III month and VI month with fifteen number of cases, area specification –

Infra orbital region, lateral nasal region, upper lip region, malar region, tabulated the presence of sensation in millimeters.

Statistical Analysis

The statistical analysis was done using SPSS (Statistical Package for Social Sciences) Version 15.0 statistical Analysis Software. The values were represented in number (%) and mean ± SD.

For two point discrimination - un paired 't' test was used and for cotton wisp test, cold thermal test and for light touch mono filament test - fisher's exact test' were used.

LIGHT TOUCH MONOFILAMENT TEST

LIGHT TOUCH MONOFILAMENT TEST-
INFRA ORBITAL REGION (IOR)

DURATION	SENSATION O AFFECTED SIDE (R)		SENSATION OF NORMAL SIDE (L)		P Value
	PRESENT	ABSENT	PRESENT	ABSENT	
PRE - OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I WEEK POST OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I MONTH POST OPERATIVE	7(46.7%)	8(53.3%)	15(100%)	0(0%)	0.002*
III MONTH POST OPERATIVE	13(86.7%)	2(13.3%)	15(100%)	0(0%)	0.483
VI MONTH POST OPERATIVE	15(100%)	0(0%)	15(100%)	0(0%)	-(constant)

*- statistically significant (p<0.05)
Constant – statistics cannot be computed

Table 1: Statistical Results Comparison of Light touch Monofilament Test between Normal and Affected side in Infra orbital Region

LIGHT TOUCH MONOFILAMENT TEST-
LATERAL NASAL REGION (LNR)

DURATION	SENSATION OF AFFECTED SIDE (R)		SENSATION OF NORMAL SIDE (L)		P Value
	PRESENT	ABSENT	PRESENT	ABSENT	
PRE - OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I WEEK POST OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I MONTH POST OPERATIVE	6(40.0%)	9(60.0%)	15(100%)	0(0%)	0.001*
III MONTH POST OPERATIVE	12(80.0%)	3(20.0%)	15(100%)	0(0%)	0.224
VI MONTH POST OPERATIVE	15(100.0%)	0(0%)	15(100%)	0(0%)	-(constant)

*- statistically significant (p<0.05)
Constant – statistics cannot be computed

Table 2: Fisher's Exact test Statistical Results Comparison of Light touch Monofilament Test between Normal and Affected side in Lateral Nasal Region.

LIGHT TOUCH MONOFILAMENT TEST-
UPPER LIP REGION (ULR)

DURATION	SENSATION OF AFFECTED SIDE (R)		SENSATION OF NORMAL SIDE (L)		P Value
	PRESENT	ABSENT	PRESENT	ABSENT	
PRE - OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I WEEK POST OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I MONTH POST OPERATIVE	5(33.3%)	10(66.7%)	15(100%)	0(0%)	0.000*
III MONTH POST OPERATIVE	13(86.7%)	2(13.3%)	15(100%)	0(0%)	0.483*
VI MONTH POST OPERATIVE	15(100.0%)	0(0%)	15(100%)	0(0%)	-(constant)

*- statistically significant (p<0.05)
Constant – statistics cannot be computed

Table 3: Fisher's Exact test Statistical Results Comparison of Light touch Monofilament Test between Normal and Affected side in Upper Lip Region

LIGHT TOUCH MONOFILAMENT TEST-
MALAR REGION (MR)

DURATION	SENSATION OF AFFECTED SIDE (R)		SENSATION OF NORMAL SIDE (L)		P Value
	PRESENT	ABSENT	PRESENT	ABSENT	
PRE - OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I WEEK POST OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I MONTH POST OPERATIVE	10(66.7%)	5(33.3%)	15(100%)	0(0%)	0.042
III MONTH POST OPERATIVE	13(86.7%)	2(13.3%)	15(100%)	0(0%)	0.483
VI MONTH POST OPERATIVE	15(100%)	0(0%)	15(100%)	0(0%)	-(constant)

*- statistically significant (p<0.05)
Constant – statistics cannot be computed

Table 4: Fisher's Exact test Statistical Results Comparison of Light touch Monofilament Test between Normal and Affected side in Malar Region

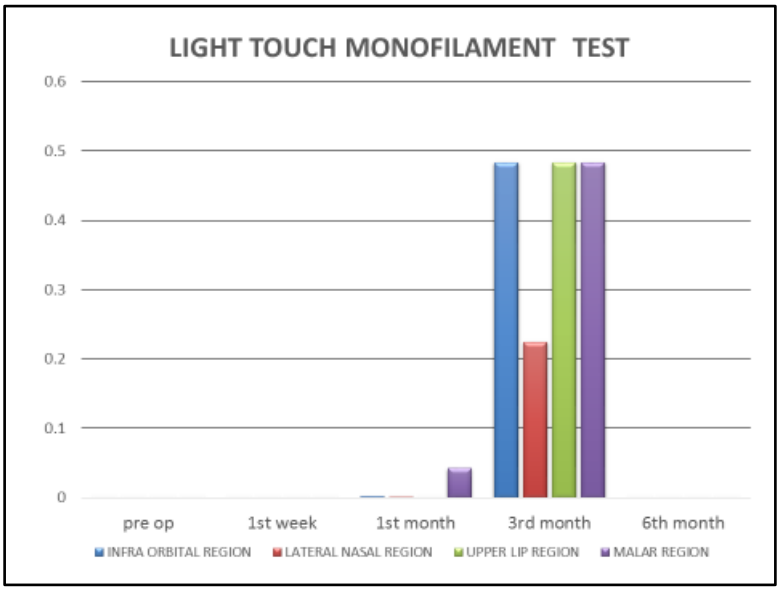

Chart 1: Statistical Significant values for Light touch Monofilament test

COTTON WISP TEST

COTTON WISP TEST-
INFRA ORBITAL REGION (IOR)

DURATION	SENSATION OF AFFECTED SIDE (R)		SENSATION OF NORMAL SIDE (L)		P Value
	PRESENT	ABSENT	PRESENT	ABSENT	
PRE - OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I WEEK POST OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I MONTH POST OPERATIVE	7(46.7%)	8(53.3%)	15(100%)	0(0%)	0.002*
III MONTH POST OPERATIVE	13(86.7%)	2(13.3%)	15(100%)	0(0%)	0.486
VI MONTH POST OPERATIVE	15(100%)	0(0%)	15(100%)	0(0%)	-(constant)

*- statistically significant (p<0.05)
Constant – statistics cannot be computed

Table 05: Fisher's Exact test Statistical Results Comparison of Cotton wisp Test between Normal and Affected side in Infra orbital Region

COTTON WISP TEST-
LATERAL NASAL REGION (LNR)

DURATION	SENSATION OF AFFECTED SIDE (R)		SENSATION OF NORMAL SIDE (L)		P Value
	PRESENT	ABSENT	PRESENT	ABSENT	
PRE - OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I WEEK POST OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I MONTH POST OPERATIVE	6(40%)	9(60%)	15(100%)	0(0%)	0.001*
III MONTH POST OPERATIVE	12(80%)	3(20%)	15(100%)	0(0%)	0.224
VI MONTH POST OPERATIVE	15(100%)	0(0%)	15(100%)	0(0%)	-(constant)

*- statistically significant (p<0.05)
Constant – statistics cannot be computed

Table 6: Fisher's Exact test Statistical Results Comparison of Cotton wisp Test between Normal and Affected side in Lateral Nasal Region

COTTON WISP TEST-
UPPER LIP REGION (ULR)

DURATION	SENSATION OF AFFECTED SIDE (R)		SENSATION OF NORMAL SIDE (L)		P Value
	PRESENT	ABSENT	PRESENT	ABSENT	
PRE - OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I WEEK POST OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I MONTH POST OPERATIVE	5(33.3%)	10(66.7%)	15(100%)	0(0%)	0.000*
III MONTH POST OPERATIVE	13(86.7%)	2(13.3%)	15(100%)	0(0%)	0.483
VI MONTH POST OPERATIVE	15(100%)	0(0%)	15(100%)	0(0%)	-(constant)

*- statistically significant (p<0.05)
Constant – statistics cannot be computed

Table 7: Fisher's Exact test Statistical Results Comparison of Cotton wisp Test between Normal and Affected side in Upper lip Region

COTTON WISP TEST-
MALAR REGION (MR)

DURATION	SENSATION OF AFFECTED SIDE (R)		SENSATION OF NORMAL SIDE (L)		P Value
	PRESENT	ABSENT	PRESENT	ABSENT	
PRE - OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I WEEK POST OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I MONTH POST OPERATIVE	10(66.7%)	5(33.3%)	15(100%)	0(0%)	0.042
III MONTH POST OPERATIVE	13(86.7%)	2(13.3%)	15(100%)	0(0%)	0.483
VI MONTH POST OPERATIVE	15(100%)	0(0%)	15(100%)	0(0%)	-(constant)

*- statistically significant (p<0.05)
Constant – statistics cannot be computed

Table 8: Fisher's Exact test Statistical Results Comparison of Cotton wisp Test between Normal and Affected side in Malar Region

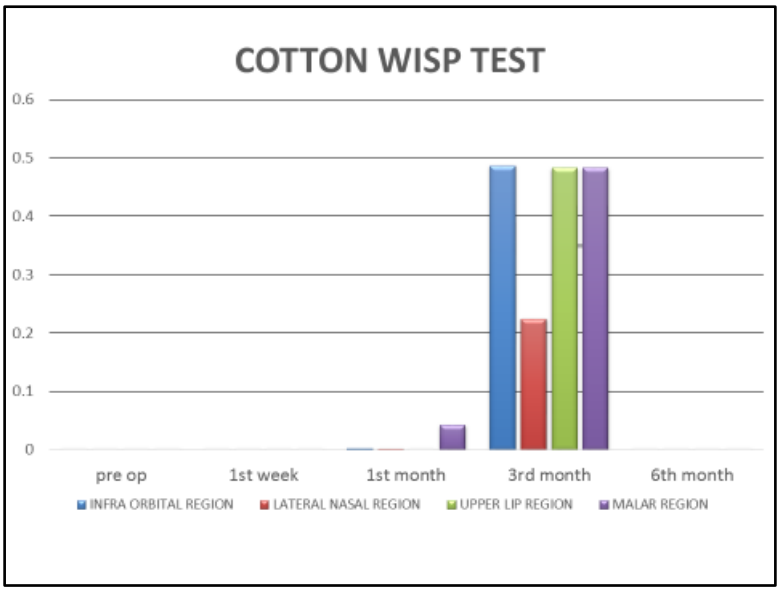

Chart 2: Statistical Significant values for Cotton Wisp Test

COLD THERMAL TEST

COLD THERMAL TEST-
INFRA ORBITAL REGION (IOR)

DURATION	SENSATION OF AFFECTED SIDE (R)		SENSATION OF NORMAL SIDE (L)		P Value
	PRESENT	ABSENT	PRESENT	ABSENT	
PRE - OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I WEEK POST OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I MONTH POST OPERATIVE	13(86.7%)	2(13.3%)	15(100%)	0(0%)	0.48
III MONTH POST OPERATIVE	13(86.7%)	2(13.3%)	15(100%)	0(0%)	0.48
VI MONTH POST OPERATIVE	15(100%)	0(0%)	15(100%)	0(0%)	-(constant)

***- statistically significant (p<0.05)**
Constant – statistics cannot be computed

Table 9: Fisher's Exact test Statistical Results Comparison of Cold Thermal Test between Normal and Affected side in Infra Orbital Region

COLD THERMAL TEST-
LATERAL NASAL REGION (LNR)

DURATION	SENSATION OF AFFECTED SIDE (R)		SENSATION OF NORMAL SIDE (L)		P Value
	PRESENT	ABSENT	PRESENT	ABSENT	
PRE - OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I WEEK POST OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I MONTH POST OPERATIVE	6(40%)	9(60%)	15(100%)	0(0%)	0.001*
III MONTH POST OPERATIVE	12(80%)	3(20%)	15(100%)	0(0%)	0.224
VI MONTH POST OPERATIVE	15(100%)	0(0%)	15(100%)	0(0%)	-(constant)

*- statistically significant (p<0.05)
Constant – statistics cannot be computed

Table 10: Fisher's Exact test Statistical Results Comparison of Cold Thermal Test between Normal and Affected side in Lateral Nasal Region

COLD THERMAL TEST-
UPPER LIP REGION (ULR)

DURATION	SENSATION OF AFFECTED SIDE (R)		SENSATION OF NORMAL SIDE (L)		P Value
	PRESENT	ABSENT	PRESENT	ABSENT	
PRE - OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I WEEK POST OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I MONTH POST OPERATIVE	5(33.3%)	10(66.7%)	15(100%)	0(0%)	0.000*
III MONTH POST OPERATIVE	13(86.7%)	2(13.3%)	15(100%)	0(0%)	0.483
VI MONTH POST OPERATIVE	15(100%)	0(0%)	15(100%)	0(0%)	-(constant)

*- statistically significant (p<0.05)
Constant – statistics cannot be computed

Table 11: Statistical Results Comparison of Cold Thermal Test between Normal and Affected side in Upper Lip Region

COLD THERMAL TEST-
MALAR REGION (MR)

DURATION	SENSATION OF AFFECTED SIDE (R)		SENSATION OF NORMAL SIDE (L)		P Value
	PRESENT	ABSENT	PRESENT	ABSENT	
PRE - OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I WEEK POST OPERATIVE	0(0%)	15(100%)	15(100%)	0(0%)	0.000*
I MONTH POST OPERATIVE	10(66.7%)	5(33.3%)	15(100%)	0(0%)	0.042
III MONTH POST OPERATIVE	13(86.7%)	2(13.3%)	15(100%)	0(0%)	0.483
VI MONTH POST OPERATIVE	15(100%)	0(0%)	15(100%)	0(0%)	-(constant)

*- statistically significant (p<0.05)
Constant – statistics cannot be computed

Table 12: Fisher's Exact test Statistical Results Comparison of Cold Thermal Test between Normal and Affected side in Malar Region

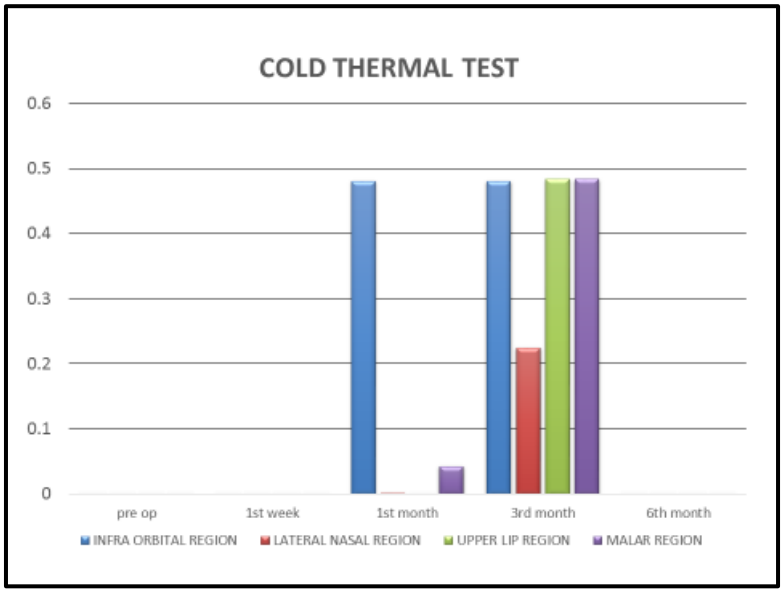

Chart 3: Statistical Significant values for Cold Thermal Test

TWO POINT DISCRIMINATION TEST

TWO POINT DISCRIMINATION TEST-
INFRA ORBITAL REGION (IOR)

DURATION	SITE	n(Numbers)	MEAN ±SD*	test score
PRE - OPERATIVE	AFFECTED SIDE (R)	15	22.40±2.028	t(28)=5.9, P≤0.05**
	NORMAL SIDE (L)	15	18.00±2.00	
I WEEK POST OPERATIVE	AFFECTED SIDE (R)	15	24.00±3.20	t(28)=6.1, P≤0.05**
	NORMAL SIDE (L)	15	18.00±2.00	
I MONTH POST OPERATIVE	AFFECTED SIDE (R)	15	21.80±3.07	t(28)=4.0, P≤0.05**
	NORMAL SIDE (L)	15	18.00±2.00	
III MONTH POST OPERATIVE	AFFECTED SIDE (R)	15	20.13±2.69	t(28)=2.4, P≤0.05**
	NORMAL SIDE (L)	15	18.00±2.00	
VI MONTH POST OPERATIVE	AFFECTED SIDE (R)	15	18.47±1.95	t(28)=0.65, P≤0.05**
	NORMAL SIDE (L)	15	18.00±2.00	

**- statistically significant (p<0.05)

Table 13: un paired 't' test Statistical Results Comparison of Two Point Discrimination Test between Normal and Affected side in Infra Orbital Region

TWO POINT DISCRIMINATION TEST-
LATERAL NASAL REGION (LNR)

DURATION	INVOLVED SIDE	n(Numbers)	MEAN +/- SD	TEST SCORE
PRE - OPERATIVE	AFFECTED SIDE (R)	15	18.67±1.79	t(28)=3.7, P≤0.05**
	NORMAL SIDE (L)	15	15.93±2.21	
I WEEK POST OPERATIVE	AFFECTED SIDE (R)	15	21.27±1.94	t(28)=7.0, P≤0.05**
	NORMAL SIDE (L)	15	15.93±2.21	
I MONTH POST OPERATIVE	AFFECTED SIDE (R)	15	18.93±2.37	t(28)=3.5, P≤0.05**
	NORMAL SIDE (L)	15	15.93±2.21	
III MONTH POST OPERATIVE	AFFECTED SIDE (R)	15	17.87±1.92	t(28)=2.5, P≤0.05**
	NORMAL SIDE (L)	15	15.93±2.21	
VI MONTH POST OPERATIVE	AFFECTED SIDE (R)	15	16.60±1.50	t(28)=0.9, P≤0.05**
	NORMAL SIDE (L)	15	15.93±2.21	

**- statistically significant (p<0.05)

Table 14: un paired 't' test Statistical Results Comparison of Two Point Discrimination Test between Normal and Affected side in Lateral Nasal Region

TWO POINT DISCRIMINATION TEST-
UPPER LIP REGION (ULR)

DURATION	INVOLVED SIDE	n(Numbers)	MEAN +/- SD	TEST SCORE
PRE - OPERATIVE	AFFECTED SIDE (R)	15	21.73±2.37	t(28)=4.4, P≤0.05**
	NORMAL SIDE (L)	15	18.13±2.06	
I WEEK POST OPERATIVE	AFFECTED SIDE (R)	15	23.60±3.79	t(28)=4.9, P≤0.05**
	NORMAL SIDE (L)	15	18.13±2.06	
I MONTH POST OPERATIVE	AFFECTED SIDE (R)	15	21.27±3.08	t(28)=3.2, P≤0.05**
	NORMAL SIDE (L)	15	18.13±2.06	
III MONTH POST OPERATIVE	AFFECTED SIDE (R)	15	20.33±3.01	t(28)=2.3, P≤0.05**
	NORMAL SIDE (L)	15	18.13±2.06	
VI MONTH POST OPERATIVE	AFFECTED SIDE (R)	15	18.80±1.65	t(28)=0.9, P≤0.05**
	NORMAL SIDE (L)	15	18.13±2.06	

**- statistically significant (p<0.05)

Table 15: un paired 't' test Statistical Results Comparison of Two Point Discrimination Test between Normal and Affected side in Upper Lip Region

TWO POINT DISCRIMINATION TEST-
MALAR REGION (MR)

DURATION	INVOLVED SIDE	n(Numbers)	MEAN +/- SD	Test score
PRE - OPERATIVE	AFFECTED SIDE (R)	15	20.80±2.24	t(28)=4.6, P≤0.05**
	NORMAL SIDE (L)	15	17.07±2.12	
I WEEK POST OPERATIVE	AFFECTED SIDE (R)	15	22.40±2.53	t(28)=6.4, P≤0.05**
	NORMAL SIDE (L)	15	16.80±2.24	
I MONTH POST OPERATIVE	AFFECTED SIDE (R)	15	20.00±3.20	t(28)=3.1, P≤0.05**
	NORMAL SIDE (L)	15	16.13±3.58	
III MONTH POST OPERATIVE	AFFECTED SIDE (R)	15	18.67±2.69	t(28)=2.0, P≤0.05**
	NORMAL SIDE (L)	15	16.80±2.24	
VI MONTH POST OPERATIVE	AFFECTED SIDE (R)	15	17.60±2.89	t(28)=0.8, P≤0.05**
	NORMAL SIDE (L)	15	16.80±2.24	

**- statistically significant (p<0.05)

Table 16: un paired 't' test Statistical Results Comparison of Two Point Discrimination Test between Normal and Affected side in Malar Region

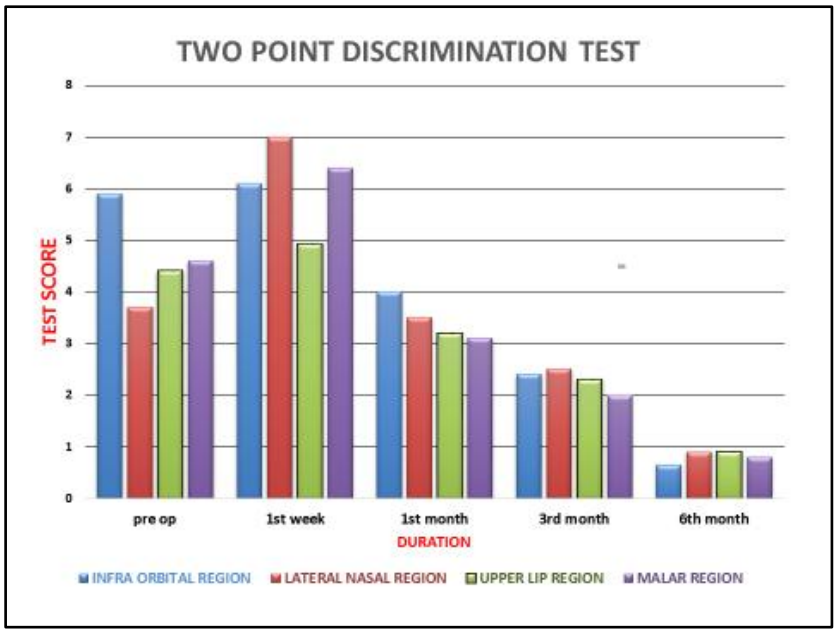

Chart 4: Test Score values for Two Point Discrimination Test

Table: 17: LIGHT TOUCH MONOFILAMENT TEST (NORMAL SIDE – LEFT SIDE): _" - " ABSENCE _" + " PRESENCE

AREA	INFRA ORBITAL REGION					LATERAL NASAL REGION					UPPER LIP REGION					MALAR REGION				
Duration	Pre op	I week	I Month	III Month	VI Month	Pre op	I week	I Month	III Month	VI Month	Pre op	I week	I Month	III Month	VI Month	Pre op	Ist week	Ist Month	IIIrd Month	Sixth Month
1.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
5.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
6.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
7.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
8.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
9.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
10.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
11.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
12.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
13.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
14.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
15.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

Table: 18:LIGHT TOUCH MONOFILAMENT TEST (AFFECTED SIDE – RIGHT SIDE): _" - " ABSENCE _" + " PRESENCE

AREA	INFRA ORBITAL REGION					LATERAL NASAL REGION					UPPER LIP REGION					MALAR REGION				
Duration	Pre op	I week	I Month	III Month	VI Month	Pre op	I week	I Month	III Month	VI Month	Pre op	I week	I Month	III Month	VI Month	Pre op	Ist week	Ist Month	IIIrd Month	Sixth Month
1.	-	-	+	+	+	-	-	-	+	+	-	-	-	-	+	-	-	-	+	+
2.	-	-	-	+	+	-	-	+	+	+	-	-	+	+	+	-	-	-	-	+
3.	-	-	-	-	+	-	-	-	+	+	-	-	-	+	+	-	-	+	+	+
4.	-	-	+	+	+	-	-	+	+	+	-	-	+	+	+	-	-	+	+	+
5.	-	-	-	+	+	-	-	-	-	+	-	-	-	+	+	-	-	+	+	+
6.	-	-	+	+	+	-	-	-	+	+	-	-	-	+	+	-	-	+	+	+
7.	-	-	-	+	+	-	-	-	+	+	-	-	-	+	+	-	-	+	+	+
8.	-	-	+	+	+	-	-	+	+	+	-	-	-	+	+	-	-	+	+	+
9.	-	-	+	+	+	-	-	+	+	+	-	-	+	+	+	-	-	+	+	+
10.	-	-	-	+	+	-	-	-	+	+	-	-	-	+	+	-	-	-	+	+
11.	-	-	-	+	+	-	-	-	-	+	-	-	-	+	+	-	-	+	+	+
12.	-	-	+	+	+	-	-	+	+	+	-	-	-	-	+	-	-	-	+	+
13.	-	-	+	+	+	-	-	-	+	+	-	-	+	+	+	-	-	+	+	+
14.	-	-	-	+	+	-	-	+	+	+	-	-	+	+	+	-	-	+	+	+
15.	-	-	-	-	+	-	-	-	-	+	-	-	-	+	+	-	-	-	-	+

TABLE:19: COTTON WISP TEST (NORMAL SIDE – LEFT SIDE): _" - " ABSENCE _" + " PRESENCE

AREA	INFRA ORBITAL REGION					LATERAL NASAL REGION					UPPER LIP REGION					MALAR REGION				
Duration	Pre op	I week	I Month	III Month	VI Month	Pre op	I week	I Month	III Month	VI Month	Pre op	I week	I Month	III Month	VI Month	Pre op	Ist week	Ist Month	IIIrd Month	Sixth Month
1.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
5.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
6.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
7.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
8.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
9.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
10.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
11.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
12.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
13.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
14.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
15.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

Table: 20:COTTON WISP TEST (AFFECTED SIDE – RIGHT SIDE): _" - " ABSENCE _" + " PRESENCE

AREA	INFRA ORBITAL REGION					LATERAL NASAL REGION					UPPER LIP REGION					MALAR REGION				
Duration	Pre op	I week	I Month	III Month	VI Month	Pre op	I week	I Month	III Month	VI Month	Pre op	I week	I Month	III Month	VI Month	Pre op	Ist week	Ist Month	IIIrd Month	Sixth Month
1.	-	-	+	+	+	-	-	-	+	+	-	-	-	-	+	-	-	-	+	+
2.	-	-	-	+	+	-	-	+	+	+	-	-	+	+	+	-	-	-	-	+
3.	-	-	-	-	+	-	-	-	+	+	-	-	-	+	+	-	-	+	+	+
4.	-	-	+	+	+	-	-	+	+	+	-	-	+	+	+	-	-	+	+	+
5.	-	-	-	+	+	-	-	-	-	+	-	-	-	+	+	-	-	+	+	+
6.	-	-	+	+	+	-	-	-	+	+	-	-	-	+	+	-	-	+	+	+
7.	-	-	-	+	+	-	-	-	+	+	-	-	-	+	+	-	-	+	+	+
8.	-	-	+	+	+	-	-	+	+	+	-	-	-	+	+	-	-	+	+	+
9.	-	-	+	+	+	-	-	+	+	+	-	-	+	+	+	-	-	+	+	+
10.	-	-	-	+	+	-	-	-	+	+	-	-	-	+	+	-	-	-	+	+
11.	-	-	-	+	+	-	-	-	-	+	-	-	-	+	+	-	-	+	+	+
12.	-	-	+	+	+	-	-	+	+	+	-	-	-	-	+	-	-	-	+	+
13.	-	-	+	+	+	-	-	-	+	+	-	-	+	+	+	-	-	+	+	+
14.	-	-	-	+	+	-	-	+	+	+	-	-	+	+	+	-	-	+	+	+
15.	-	-	-	-	+	-	-	-	-	+	-	-	-	+	+	-	-	-	-	+

TABLE:21: COLD THERMAL TEST – ETHER (NORMAL SIDE – LEFT SIDE): _" - " ABSENCE _" + " PRESENCE

AREA	INFRA ORBITAL REGION					LATERAL NASAL REGION					UPPER LIP REGION					MALAR REGION				
Duration	Pre op	I week	I Month	III Month	VI Month	Pre op	I week	I Month	III Month	VI Month	Pre op	I week	I Month	III Month	VI Month	Pre op	Ist week	Ist Month	IIIrd Month	Sixth Month
1.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
5.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
6.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
7.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
8.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
9.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
10.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
11.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
12.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
13.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
14.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
15.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

Table: 22:COLD THERMAL TEST – ETHER (AFFECTED SIDE – RIGHT SIDE): _" - " ABSENCE _" + " PRESENCE

AREA	INFRA ORBITAL REGION					LATERAL NASAL REGION					UPPER LIP REGION					MALAR REGION				
Duration	Pre op	I week	I Month	III Month	VI Month	Pre op	I week	I Month	III Month	VI Month	Pre op	I week	I Month	III Month	VI Month	Pre op	Ist week	Ist Month	IIIrd Month	Sixth Month
1.	-	-	+	+	+	-	-	-	+	+	-	-	-	-	+	-	-	-	+	+
2.	-	-	-	+	+	-	-	+	+	+	-	-	+	+	+	-	-	-	-	+
3.	-	-	-	-	+	-	-	-	+	+	-	-	-	+	+	-	-	+	+	+
4.	-	-	+	+	+	-	-	+	+	+	-	-	+	+	+	-	-	+	+	+
5.	-	-	-	+	+	-	-	-	-	+	-	-	-	+	+	-	-	+	+	+
6.	-	-	+	+	+	-	-	-	+	+	-	-	-	+	+	-	-	+	+	+
7.	-	-	-	+	+	-	-	-	+	+	-	-	-	+	+	-	-	+	+	+
8.	-	-	+	+	+	-	-	+	+	+	-	-	-	+	+	-	-	+	+	+
9.	-	-	+	+	+	-	-	+	+	+	-	-	+	+	+	-	-	+	+	+
10.	-	-	-	+	+	-	-	-	+	+	-	-	-	+	+	-	-	-	+	+
11.	-	-	-	+	+	-	-	-	-	+	-	-	-	+	+	-	-	+	+	+
12.	-	-	+	+	+	-	-	+	+	+	-	-	-	-	+	-	-	-	+	+
13.	-	-	+	+	+	-	-	-	+	+	-	-	+	+	+	-	-	+	+	+
14.	-	-	-	+	+	-	-	+	+	+	-	-	+	+	+	-	-	+	+	+
15.	-	-	-	-	+	-	-	-	-	+	-	-	-	+	+	-	-	-	-	+

TABLE:23:TWO POINT DISCRIMINATION TEST (NORMAL SIDE – LEFT SIDE): _in " mm "

AREA	INFRA ORBITAL REGION					LATERAL NASAL REGION					UPPER LIP REGION					MALAR REGION				
Duration	Pre op	I week	I Month	III Month	VI Month	Pre op	I week	I Month	III Month	VI Month	Pre op	I week	I Month	III Month	VI Month	Pre op	Ist week	Ist Month	IIIrd Month	Sixth Month
1.	**14**	**14**	**14**	**14**	**14**	**12**	**12**	**12**	**12**	**12**	**16**	**16**	**16**	**16**	**16**	**14**	**14**	**14**	**14**	**14**
2.	**18**	**18**	**18**	**18**	**18**	**17**	**17**	**17**	**17**	**17**	**18**	**18**	**18**	**18**	**18**	**16**	**16**	**6**	**16**	**16**
3.	**16**	**16**	**16**	**16**	**16**	**12**	**12**	**12**	**12**	**12**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**
4.	**16**	**16**	**16**	**16**	**16**	**14**	**14**	**14**	**14**	**14**	**22**	**22**	**22**	**22**	**22**	**18**	**18**	**18**	**18**	**18**
5.	**18**	**18**	**18**	**18**	**18**	**16**	**16**	**16**	**16**	**16**	**18**	**18**	**18**	**18**	**18**	**18**	**14**	**14**	**14**	**14**
6.	**18**	**18**	**18**	**18**	**18**	**16**	**16**	**16**	**16**	**16**	**20**	**20**	**20**	**20**	**20**	**16**	**16**	**16**	**16**	**16**
7.	**20**	**20**	**20**	**20**	**20**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**18**	**18**	**18**	**18**	**18**
8.	**18**	**18**	**18**	**18**	**18**	**14**	**14**	**14**	**14**	**14**	**18**	**18**	**18**	**18**	**18**	**16**	**16**	**16**	**16**	**16**
9.	**22**	**22**	**22**	**22**	**22**	**18**	**18**	**18**	**18**	**18**	**20**	**20**	**20**	**20**	**20**	**16**	**16**	**16**	**16**	**16**
10.	**20**	**20**	**20**	**20**	**20**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**12**	**12**	**12**	**12**	**12**
11.	**20**	**20**	**20**	**20**	**20**	**16**	**16**	**16**	**16**	**16**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**
12.	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**16**	**16**	**16**	**16**	**16**	**20**	**20**	**20**	**20**	**20**
13.	**18**	**18**	**18**	**18**	**18**	**16**	**16**	**16**	**16**	**16**	**14**	**14**	**14**	**14**	**14**	**18**	**18**	**18**	**18**	**18**
14.	**16**	**16**	**16**	**16**	**16**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**18**	**18**	**18**	**18**	**18**
15.	**18**	**18**	**18**	**18**	**18**	**16**	**16**	**16**	**16**	**16**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**

Table: 24:TWO POINT DISCRIMINATION TEST (AFFECTED SIDE – RIGHT SIDE): _in " mm "

Area	INFRA ORBITAL REGION					LATERAL NASAL REGION					UPPER LIP REGION					MALAR REGION				
Duration	Pre op	I week	I Month	III Month	VI Month	Pre op	I week	I Month	III Month	VI Month	Pre op	I week	I Month	III Month	VI Month	Pre op	Ist week	Ist Month	IIIrd Month	Sixth Month
1.	**22**	**28**	**18**	**18**	**14**	**16**	**20**	**16**	**16**	**15**	**26**	**30**	**24**	**24**	**18**	**22**	**24**	**20**	**20**	**16**
2.	**26**	**32**	**30**	**26**	**18**	**20**	**24**	**18**	**18**	**18**	**24**	**28**	**26**	**26**	**20**	**20**	**22**	**18**	**18**	**16**
3.	**20**	**20**	**18**	**18**	**16**	**18**	**22**	**16**	**16**	**14**	**22**	**28**	**24**	**24**	**20**	**20**	**24**	**18**	**20**	**18**
4.	**24**	**26**	**20**	**18**	**17**	**18**	**22**	**20**	**18**	**16**	**26**	**30**	**26**	**24**	**22**	**24**	**24**	**20**	**18**	**18**
5.	**22**	**22**	**20**	**18**	**18**	**16**	**20**	**18**	**16**	**16**	**24**	**26**	**24**	**20**	**18**	**18**	**20**	**20**	**16**	**14**
6.	**20**	**22**	**22**	**18**	**18**	**18**	**22**	**20**	**16**	**16**	**22**	**22**	**22**	**20**	**20**	**20**	**18**	**18**	**18**	**18**
7.	**22**	**20**	**20**	**20**	**20**	**16**	**18**	**16**	**16**	**14**	**20**	**20**	**20**	**18**	**18**	**22**	**20**	**20**	**18**	**18**
8.	**24**	**24**	**20**	**18**	**18**	**20**	**18**	**16**	**16**	**16**	**20**	**22**	**20**	**20**	**18**	**20**	**20**	**20**	**18**	**16**
9.	**26**	**24**	**24**	**22**	**22**	**20**	**22**	**22**	**18**	**18**	**22**	**22**	**20**	**20**	**20**	**18**	**20**	**16**	**16**	**16**
10.	**22**	**26**	**24**	**24**	**20**	**18**	**22**	**20**	**20**	**18**	**20**	**22**	**21**	**21**	**20**	**18**	**22**	**16**	**14**	**14**
11.	**20**	**24**	**22**	**20**	**20**	**20**	**22**	**20**	**20**	**16**	**18**	**22**	**20**	**20**	**20**	**22**	**24**	**20**	**20**	**20**
12.	**22**	**22**	**20**	**18**	**18**	**18**	**20**	**20**	**18**	**18**	**20**	**22**	**20**	**18**	**18**	**26**	**28**	**28**	**26**	**26**
13.	**24**	**26**	**25**	**24**	**20**	**20**	**25**	**24**	**22**	**18**	**22**	**22**	**20**	**16**	**16**	**20**	**24**	**24**	**20**	**18**
14.	**20**	**22**	**22**	**20**	**18**	**22**	**20**	**20**	**20**	**18**	**20**	**18**	**16**	**16**	**16**	**22**	**24**	**24**	**20**	**18**
15.	**22**	**22**	**22**	**20**	**20**	**20**	**22**	**18**	**18**	**18**	**20**	**20**	**16**	**18**	**18**	**20**	**22**	**18**	**18**	**18**

DISCUSSION

Facial fractures involving the facial bones in particular have undergone a progressive increase in severity as the speed and number of automobiles has increased and also due to our society which has become more mobile and urbanized. The relatively simple fracture of those old days has been replaced by the comminuted and often compound type of fractures which frequently involves the middle third of facial skeleton including the orbital cavities, ocular globes and cranial fossa.

The Zygomatic bone fractures are the second commonest fractures of facial bones, those of nasal bone being the most common. The zygoma is highly susceptible to trauma alone to its anatomical prominent position. The bone forms a very important part of facial framework and serves as a buttress between the face and skull. It plays a vital role in protecting the eyes and participates in the formation of orbital cavity, the maxillary sinus, temporal fossa and zygomatic arch. Traumatic injuries of the face rarely involve the zygoma alone but tend to involve its articulating surfaces which are maxilla, temporal, frontal and sphenoid bones.

Jungell et al (1987) have stated that post traumatic hypothesia is one of the indicative for zygomatic fracture.[34]

The susceptibility of zygomatic bone to fracture is explained by MARKUS ZINGG et al (1992) zygomatic bone is the most commonly fractured bone after the nasal bone as stated by vernard and Jackson. Yong Oock Kim state that fracture of zygoma are most common comparing to other bones.[46]

As Robert Marciani (1993) states that the motor vehicle accidents are the most common cause of the facial skeleton fractures. In our present study of 15 cases, had a history of RTA.

The clinical picture combines one, several or all of the following: Edema of the cheek and eyelids, circumorbitalechymosis, flattening of malar prominence, paraesthesia in the distribution of infraorbital nerve, diplopia, ocular symptoms, restricted mandibular movements, tenderness and step deformity of the zygomatic buttress intraorally and also of infraorbital rim.

In our study, the patients had some or most of the features mentioned earlier. As mentioned by ROBERT MARCIANI and other authors after the clinical examination, diagnosis is confirmed with imaging techniques. In all these cases paranasal view as well as CT

scans were taken to visualize the fractured zygoma to confirm the diagnosis.

Opthalmic consultation is mandatory in zygomatic complex fractures. As mentioned by Peter B Grey et al (1993), delayed retro bulbar hemorrhage and transient blindness can be the result of fracture. M G Gilhooly et al (1995) present a case of orbital sub periosteal abcess and blindness complicating a minimally displaced fracture. Even in medico legal point of view, it is very essential to have an opthalmologist's consent and opinion regarding the vision, accommodation and other ocular functions. In our study, none of the patients had any ocular defects.

The principle of management of isolated zygomatic complex fracture involves the reduction of the fractured segments to their normal anatomic relationship to provide bony contact and alignment. Excessive muscular force and motion at the site of the fracture, impede healing. In turn, these factors stimulate the non-osteogenic cells to invade the area, which results in fibrous union. Therefore, accurate anatomic reduction and fixation is a must to achieve healing of the fractured bone.

The IO nerve is often involved in trauma to the zygomatic complex at the site of the IO fissure, IO canal, or foramen. This results in sensory disturbances including all kinds of dysaesthesia and

neuralgicform pain to the skin of the lower eyelid, cheek, lateral side of the nose, and upper lip and to the labial mucosa, gingival and teeth.

Several authors have used different methods to assess neurosensory deficit of infra orbital nerve such as Two-point discrimination, pressure thresholds, pinprick test, masseter silent period, gross assessment with sharp and blunt instruments and thermography, and gross temperature assessments with ethyl chloride, ice, or warmed gutta percha and, have all been adapted to the study of IO nerve recovery following trauma, in our study two point discrimination, light touch monofilament, cotton wisp and cold thermal with ether have been advocated to test for neurosensory assessment of infraorbital nerve.

According to Vriens et al. (1998) incidence of initial sensory disturbance in patients ranges from 58 to 94% following orbitozygomatic complex fracture, in our study 100% of cases had neurosensory deficit in the distribution of infra orbital nerve.[72]

The neurological symptoms arise from the fact that the fracture line runs through or in the immediate vicinity of the IO canal and foramen, affecting the IO nerve. This results in dysaesthesia of the skin of the lower eyelid, cheek and nose, the skin and mucosa of the upper lip, gingival and/or teeth on the affected side. Complete impairment of

sensation seldom occurs; hypoesthesia is most frequently present followed by paresthesia and hyperesthesia.

In the zygomatic fractures the nature of nerve injury are unclear and may involve traction, pressure, ischemia, inflammation, and physical damage.

De Man et al (1988) illustrated that routine use of miniplates and screws are indicated as the choice of treatment for the neurosensory damage recovery following trauma, in our study all the 15 patients have underwent open reduction and internal fixation followed in sixth month post operatively, all the patients have recovered from the infra orbital neurosensory paresthesia.[13]

Benoliel et al have reported that on comparing with the affected side and normal side at the post operative period of sixth month, there was no significant difference which was similar to our current study.[7]

Pedemontet TC (2005) et al described by Lewis theory, stating that when a nerve is compressed, the fibers are affected differently: the bigger the fiber, the more likely to be affected by trauma. Fibers are therefore affected in the order of their size.

Champy et al, Zing et al, Taicher et al, have stated that earlier surgical intervention will have better prognosis in nerve regeneration,

similarly in our study on average in three days post traumatically we have operated and in one case we have operated twelve days post traumatically due to anesthetically unfit because of uncontrolled diabetic and was under medication.[65]

The classical technique for reduction of fractured zygoma is the Gillie's temporal approach described by Gillie's, Kilner and Stone in 1927. In a recent survey of practising fellows of the British Association of Oral and Maxillofacial surgeons, the Gillie's temporal approach was used in 74% of cases of severely displaced fractures. The advantages of Gillie's temporal approach are reducing the operating time, decreasing the possibility of damage to facial nerve, damage or direct trauma to the globe by instruments inserted to protect the eye and the scar being within the hairline.[24]

The recovery rate of persistent sensory disturbance of Inferior orbital nerve is higher in this approach. S.Taicher et al in 1993 proposed a study and concluded that patients treated with miniplate osteosynthesis via Gillie's temporal approach exhibited a higher recovery rate of Inferior orbital nerve than other methods.

The use of reduction and superiority of miniplates for the fixation of zygomatic fractures in preventing sensory deficit of the IO nerve is supported by our findings.

In our limited study of 15 patients, we found that management of zygomatic complex fractures by open reduction and internal fixation was very effective and reliable to predict the recovery of neurosensory effect of infraorbital nerve over the period of six months.

SUMMARY AND CONCLUSION

This prospective study of neurosensory responses of Infraorbital Nerves was conducted in fifteen patients who had undergone open reduction and internal fixation at the Department of Oral & Maxillofacial Surgery, Adhiparasakthi dental college and hospital, Melmaruvathur, from 2015-2016.

The main objective was to evaluate the nature of sensory impairment and regeneration of sensation and find out the factors of value in predicting regeneration of nerve function. The results suggested that neurosensory disturbance in IO nerve was present in all the patients with zygomatic complex fractures

Neurosensory responses of infraorbital nerves were evaluated in all the fifteen patients by subjective methods. The tests were carried out on pre operatively, post-operatively - first week, first month, third month, sixth and month

During this study, significant observations came to light. They are,

1. Neurosensory disturbances were seen in all the fifteen patients on the first post-operative week.
2. No patients experienced severe symptoms like pain, burning sensation

3. Type of intraoperative nerve manipulation, magnitude of the mobilisation of fractured fragments, were observed as the contributing factors for neurosensory deficit.
4. Recovery of sensation was seen in all the fifteen patients within 3 to 6 months.

In conclusion, the incidence of functional nerve disturbances is acceptable, since the progression towards recovery is inevitable. This study also states that the patients underwent open reduction with internal fixation had a good recovery of the nerve injury.

This being a pilot study, further evaluation is required with more number of clinical data and follow up.

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PROFORMA

ADHIPARASAKTHI DENTAL COLLEGE & HOSPITAL

MELMARUVATHUR

Department of Oral & Maxillofacial Surgery

INFORMED CONSENT

NEUROSENSORY ASSESSMENT OF INFRAORBITAL NERVE FOLLOWING ISOLATED UNILATERAL ZYGOMATICOMAXILLARY COMPLEX FRACTURES-A PROSPECTIVE STUDY

Patient Name : Age : Gender : IP Number : OP Number :

Diagnosis : Right Zygomatic Maxillary Complex fracture

UNDERTAKING BY THE INVESTIGATOR:

Your consent to participate in the above study is sought. You have the right to refuse consent or withdraw the same during any part of the study without giving any reason. We undertake to maintain complete confidentiality regarding the identity of the subjects and the information obtained from the subject/patient during the course of the study. We assure that all the standard infection control precautions will be strictly adhered to throughout the study. If you have any doubts regarding the study, please feel free to clarify the same. Even during the study, you are free to contact any of the investigators for clarification if you desire. The list of investigators and their contact numbers are below:

CONSENT FOR NEUROSENSORY ASSESSMENT OF INFRAORBITAL NERVE

I _____the undersigned hereby authorize Dr. _____ at Adhiparasakthi Dental College and Hospital to perform upon me the following procedure(s) for research purpose:

In this procedure, all the patients after pre-operative evaluation and obtaining the written informed consent, all the patients sustaining unilateral zygomaticomaxillary complex fractures will be included in the study. The neurosensory evaluation will include cotton wisp test, light test – with monofilament, cold – Thermal test with ether and two point discrimination. The areas to be examined will be done mid way of the dimensions of lower eye lid, middle of the lateral part of nose, middle portion of the upper lip and middle of zygoma bilaterally with the non-affected side providing the normal side as control. The above procedure along with the purpose of the study has been explained to me in detail in intelligible terms. I have received appropriate response to all my doubts and clarifications. I understand that I may be exposed to radiation dose twice or more during the course of the study. I also understand that photographs will be taken in the course of the study and that the results generated from this study can be published in scientific literature, for which I do not have any objections. I have understood that I have the right to refuse my consent or withdraw it at any time during the study.

I understand that signing this consent form indicates that I voluntarily agree to participate in this study.

I confirm that I understand the information presented in this consent form.

Signature of Participant

Date :

Place :

Signature of Witness

Date :

Place :

Signature of the investigator 1

Date :

Place :

Signature of the investigator 2

Date :

Place :

ADHIPARASAKTHI DENTAL COLLEGE & HOSPITAL

MELMARUVATHUR

Department of Oral & Maxillofacial Surgery

NEUROSENSORY ASSESSMENT OF INFRAORBITAL NERVE FOLLOWING ISOLATED UNILATERAL ZYGOMATICOMAXILLARY COMPLEX FRACTURES- A PROSPECTIVE STUDY

Patient Name : Age : Gender:

IP Number : OP Number :

Diagnosis : Right Zygomatic Maxillary Complex fracture

PRE – OPERATIVE :

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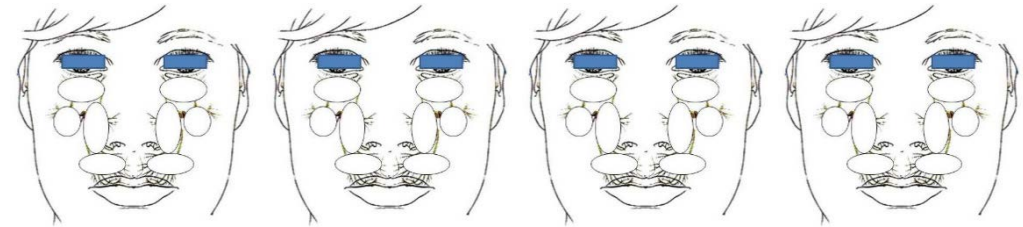

I WEEK POST OPERATIVE DAY :

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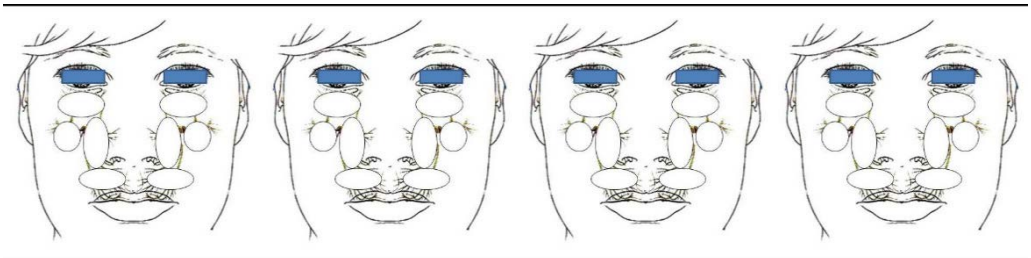

I MONTH POST OPERATIVE :

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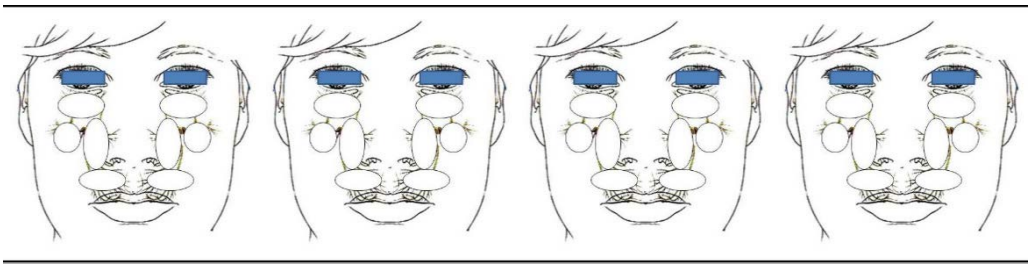

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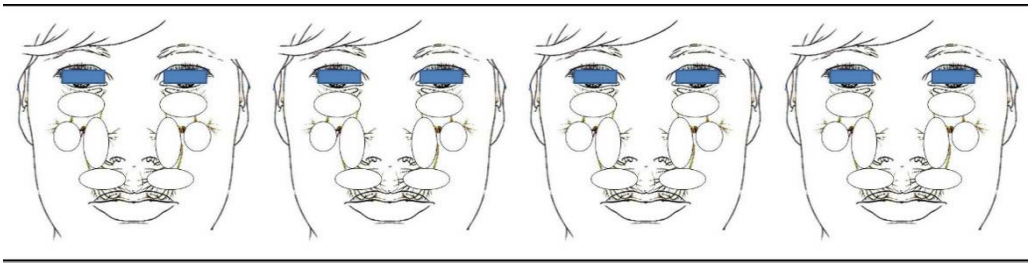

VI MONTH POST OPERATIVE :

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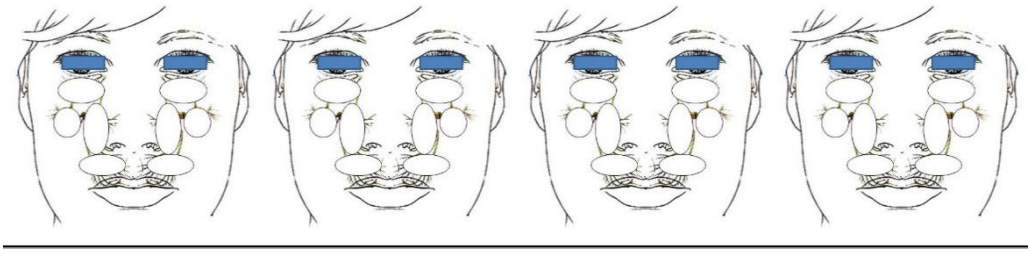

ஆதிபராசக்தி பல்மருத்துவ கல்லூரி மற்றும் மருத்துவமனை

மேல்மருவத்தூர்

வாய் நோய் அறுவை சிகிச்சைக்கான ஒப்புதல் படிவம்

துறை : _____

தேதி :

நோயாளியின் பெயர் : _____

வயது / பாலினம் : _____

புறநோயாளி ஏண் : _____

அறுவை சிகிச்சை மருத்துவ நிபுணரின் பெயர் : _____

சிகிச்சையின் பெயர் : _____

_____

அளிக்கப்படும் மயக்க மருந்தின் வகை : _____

எனது தற்போதைய வாய்நலம் குறித்தும் , அதற்கு உரிய அறுவை சிகிச்சை முறைகளையும் , மாற்று அறுவை சிகிச்சை முறைகளையும் மற்றும் அறுவை சிகிச்சை மேற் கொள்ளாவிடில் ஏற்படும் பின் விளைவுகளும் பல் மருத்துவர் முழுமையாக என்னிடம் கூறினார் . அதற்கான எனது சந்தேகங்களையும் பல் மருத்துவரிடம் கேட்டு தெளிவுபடுத்திக்கொண்டேன் . மேலும் அறுவை சிகிச்சை முறை , என் அறுவை சிகிச்சையின் போது தேவைப்படும் மயக்க மருந்துகள் மாற்றும் பிற மருந்துகள் செலுத்த சம்மதிக்கின்றேன். நான் மனப்பூர்வமாக எனது அறுவை சிகிச்சைமுறை மாற்றும் அதனால் வரும் பின் விளைவுகளையும் ஏற்றுக் கொள்கிறேன் மற்றும் மருத்துவர் கூறும் அறிவுரைகளும் கடைபிடிப்பேன்.

நோயாளியின் உதவியாளர் / பெற்றோரின் கையொப்பம் நோயாளியின் கையொப்பம்

அறுவை சிகிச்சை நிபுணரின் கையொப்பம் மருத்துவரின் கையொப்பம்

INSTITUTIONAL ETHICS COMMITTEE AND REVIEW BOARD

ADHIPARASAKTHI DENTAL COLLEGE AND HOSPITAL

Melmaruvathur, Tamilnadu-603319

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MEMBER SECRETARY

Dr.S.Meenakshi, PhD

This ethical committee has undergone the research protocol submitted by Dr.Vinod krishna. K, Post Graduate Student, Department of Oral And Maxillofacial Surgery under the title **Neurosensory Assessment of Infraorbital Nerve Following Isolated Unilateral Zygomaticomaxillary Complex Fractures - A prospective study** Reference No: **2014-MD-BrIII-BAL-07,** under the guidance of Prof Dr.Gokkulakrishnan for consideration of approval to proceed with the study.

This committee has discussed about the material being involved with the study, the qualification of the investigator, the present norms and recommendation from the Clinical Research scientific body and comes to a conclusion that this research protocol fulfils the specific requirements and the committee authorizes the proposal.

Date: **Member secretary**